REMARKS

Favorable consideration of this Application as presently amended and in light of the following discussion is respectfully requested. Support for newly added claim 39 can be found in claim 38.

The applicant appreciates that the Examiner has withdrawn all the previous rejections except for claims 26-30 and 32-38 being rejected under 35 U.S.C. 103(a) as obvious over Segal 6,238,494 B1 ("Segal"). The applicant respectfully traverses this rejection.

The applicant has two independent (claims 26 and 32).

Claim 26 states:

> A refractory metal plate comprising
> a thickness,
> a center, and
> an edge,
> the metal being selected from the group consisting of tantalum and niobium, said metal being of at least 99.99% purity, the plate having an average grain size of less than 40 microns and a texture that is uniform both through said thickness and from said center to said edge, and further wherein said refractory metal plate has
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> i) a constant mix of grains with orientation {100} and {111} crystallographic orientations, and
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> ii) **a distribution of {100} and {111} crystallographic orientations that varies by less than 30 percent across the surface of any plane of said refractory metal plate**, said planes being selected from planes that are orthogonal to the thickness of said refractory metal plate, and planes that are diagonal to the thickness of said refractory metal plate, and uniform through the thickness from the center of the plate to the edge of the plate **with no preferred direction within the plate so there is not a predominantly {100} or {111} orientation** and
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> iii) **a distribution of {100} and {111} crystallographic orientations that varies by less than 30 percent across any thickness of said refractory metal plate**. (emphasis added)

Claim 32 states:

> A refractory metal plate comprising
> a thickness,
> a center, and
> an edge,
> the metal being selected from the group consisting of tantalum and niobium, the plate having a texture that is uniform both through said thickness and from said center to said edge, and further wherein said refractory metal plate has
>
> i) **<u>a distribution of {100} and {111} crystallographic orientations that varies by less than 30 percent across the surface of any plane of said refractory metal plate</u>**, and is uniform through the thickness from the center of the plate to the edge of the plate with no preferred direction within the plate so there is not a predominantly {100} or {111} orientation and
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> ii) **<u>a distribution of {100} and {111} crystallographic orientations that varies by less than 30 percent across any thickness of said refractory metal plate.</u>** (emphasis added)

The applicant's claimed invention requires a distribution of {100} and {111} crystallographic orientations that varies by less than 30 percent. This is a critical feature.

The concept of 'distribution' was used to quantify the variation in texture from area to area. As shown in the Declaration of Peter Jepson. The data in the <u>first</u> declaration of Peter Jepson, submitted in the response of March 15, 2005, demonstrates that a KT plate prepared in accordance with Turner '233 had one area with 37% {100} and 13% {111}, but another area with 11% {100} and 51% {111}. The difference therefore varied from +24% to -40%, a 'distribution' of 64%. The declaration showed the criticality of a 'distribution' which was always <30%.

Since the sputtering rate of a grain depends on its orientation, the sputtering rate of an area of a target depends on the mix of orientations of the grains in that area. Attached is a publication relating some experimental results (Zhang et al. J. Vac. Sci. Technol. A 24 (4) Jul/Aug 2006). These results are after the filing of this application. In that paper, the grain closest to {100} is grain 7 (sputtering rate 0.77) and the grain closest to {111} is grain 3 (0.51).

The applicant has informed the undersigned of the following:

If one area of the target consists of 50% {100} grains and 50% {111} grains: its sputtering rate is 0.64. If 50 - 50 were one extreme, and the distribution was 30%, the other extreme would be 65 - 35 (or 35 - 65). 65 - 35 would give a sputtering rate of 0.679. The sputtering rate would therefore be 0.66 +/- 0.02. The important number here is not the 0.66 (since the time of sputtering can be adjusted easily): it is the 0.02, or rather, the fact that 0.02 is about 3% of the average thickness. Note that the applicant has made a simplification here, in that the applicant assumed that all grains were within 15 degrees of 100 or 111. However, it illustrates the point, which is that the lower the distribution of textures in a sample or on a target, the more uniform in thickness the film would be. The distribution % would give an acceptable electronic device depends on (a) the sputtering rates of the grains which are not within 15 degrees of 100 or 111, and (b) how much thickness variability can be accepted by the device manufacturer.

The process described in Summary of the Invention of Segal has 7 steps, the first one being 'providing a metal billet'. There is nothing further stated about that billet (no property requirements are specified). A billet is simply a cylinder of material. If the billet were fine-grained with uniform texture, the results Segal claims for titanium may well apply for tantalum.

However, if the billet were an ingot (as-cast after EB-melting), which is the normal starting-point, the applicant has informed the undersigned that the plate resulting from steps 2 to 7 would not have a uniform distribution of texture.

The applicant has informed the undersigned that used targets with an appearance compatible with the process described in Segal (if an ingot were used as the starting material): ie. the 'ghost' of the grain structure of the original ingot is visible on the sputtered surface, magnified several times in accordance with the reduction made in forging and rolling. What happens is that all the grains formed in the recrystallization (step 7) have an orientation related to the original ingot grain. Therefore one area (the area resulting from one ingot grain) is likely to be very rich in 100 (perhaps 75% 100, 5% 111) while another area (the area resulting from another ingot grain) would be rich in 111 (perhaps 5 % 100, 75% 111): the resulting distribution would be about 140%. The attached segalev.ppt illustrates how each ingot grain, after working and recrystallization, become many fine grains all with similar orientation, when an ingot is worked and recrystallized. The working in the case shown was not exactly as described by Segal (steps 2 to 6), but the applicant has informed the undersigned that a person of ordinary skill in the art with a knowledge of metallurgy would agree that the details of the working would not make much difference. For the above reasons, this rejection should be withdrawn.

In view of the above response, applicant believes the pending application is in condition for allowance.

A three month extension fee has been paid. Applicant believes no additional fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 13194-00163-US from which the undersigned is authorized to draw.

Dated: November 10, 2008

Respectfully submitted,

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Enclosure: (Zhang et al. J. Vac. Sci. Technol. A 24 (4) Jul/Aug 2006)
segalev.ppt